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COGNITIVE MODES IN BLACK KINDERGARTEN CHILDREN

Sherle Boone, Lorraine Nicolich, Mark Nicolich
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Creativity has been approached from the point of view of the personality of eminent persons, from the evaluation of creative products on the basis of their artistic merit, and from the delineation of the dimensionality of the creative process within the individual (Guilford, 1967; Wallach, 1970). The last of these is of particular interest to students of child development as well as educators, because it may yield such fruits as clues to the development of mental functions in children, the predictions of nonacademic success (Wallach and Wing, 1969), and more adequate approaches to life preparation within the school systems.

Creativity, in this study, refers to the divergent thinking process contained in Guilford's (1959) theoretical framework. Guilford employed the criteria for dimensionality in creativity as the statistical separability of factors. In this study, the Thorndike (1963) and Wallach and Kogan (1965) criteria will be used. Essentially, these investigators hold that measures of creativity, to be considered as a separate dimension, should be substantially intercorrelated among themselves and relatively uncorrelated with I.Q. measures. If a dimension of mental process separate from that measured in I.Q. testing is demonstrable, the implication is that there should be approaches to education which would at least "teach to" this mode, and at best offer practice and encouragement to such a process.

Wallach finds that the above criteria have rarely been met. He suggests associative flow of ideas and uniqueness of the content as the dimension which has shown maximum orthogonality from general intelligence.

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Moreover, in assessing creativity, task constraints and situational variables have been seen as important in maintaining this separation. For example, Maltzman (1960) found that in originality training, maximum transfer to a new task occurred when no instructions to give unusual responses were included. Mednick's (1962) results indicate that since the distinguishing feature of the creative individual may be response strength diffused to a number of associates, rather than concentrated in a few common associates, then the subject's immediate response might be a common one, with more unusual responses occurring later in the measurement situation. It follows from this that instruments for assessing this dimension should be presented on an individual basis, in an untimed situation, free from evaluative constraints, even the minimal constraint of trying to be original.

Based on these observations, Wallach and Kogan derived five instruments to assess creativity, each yielding a fluency score and a uniqueness score. Fluency refers to the number of responses and uniqueness refers to the number of responses unique to a given sample group. The instruments consisted of figural and semantic tasks. The figural tasks require the child to think of as many things as he can that the figure might be. The two figural tasks consist of line meanings and pattern meanings. The semantic tasks are similarities, instances, and alternate uses. The similarities task requires the child to tell all the ways in which two verbally specified objects are alike. Instances task requires giving names of items that represent such concepts as round things, square things, things that move on wheels, and things that make noise. The alternate uses task requires the child to give as many uses as he can for a verbally specified object.

Using these procedures and tasks, Wallach and Kogan working with 151

fifth grade children of normal to high I.Q., in a white surburban school district, were able to delineate the traits of intelligence and creativity as operationally distinct. Applying the same procedures Ward (1968), although successful with 7 and 8 years olds, obtained different results with kindergarten children. He found that for these children the figural tasks did not correlate with the semantic tasks as required by Wallach and Kogan for an operationally distinct creative mode.

This study is interested in applying the above procedures to a further sub-population, namely, Black kindergarten children. Since Ward was not successful using the figural measures with a similar age group, it was decided to use an additional instrument (blocks task). This instrument, designed by the authors, employed irregular three-dimensional blocks as stimuli. Since it was also of interest to see if teacher ratings of the child's classroom behavior would show a relationship to the dimensions measured, the Comtois Early Childhood Rating Scales were used (Comtois, 1969).

The statistical design and interpretation of results were undertaken in light of Cronbach's (1968) criticisms of the Wallach and Kogan study. The main implication of this decision is that non-parametric statistics were used for this correlation analysis. In view of Cronbach's suggestion that less-value laden terminology be used, we will refer to those measures which have been associated with creativity as F (flow, fluency, flexibility) measures. The I.Q. estimates employed here are drawn directly from the Goodenough-Harris Draw-A-Man Test (Harris, 1963). This study investigates the relationship of F, as measured in the Wallach and Kogan derived instruments, with I.Q., as measured by the standardized I.Q. test.

Method

Subjects. The Ss were nineteen kindergarten children from Black working-class families. The twelve girls and seven boys ranged in age from 4-11 to 5-11 at the time the study began. The girls' Goodenough-Harris I.Q. ranged from 70 to 126, with mean 95 and median 94.7. The boys' Goodenough-Harris I.Q. ranged from 78 to 144, with mean 99 and median 92.

Materials. The figural tasks used included line meanings, pattern meanings, and block meaning. The semantic tasks included instances and alternate uses. (See appendixes A to E).

Assessment of F. Each instrument in this group was administered individually in an evaluation free context. E spent one week in the classroom playing games with the children before inviting them individually to try out the games that would yield an F assessment. On any given day, only those children who agreed to participate were selected. In the measurement situation, a sample item preceded each measure. During practice and measurement trials Ss were praised for their responses and rewarded with candy at the end of each session.

Comtois Early Childhood Rating Scales. The Comtois scales are designed for the use of teachers in rating the specific behavioral characteristics of preschool or early school children. A rating is given on 16 characteristics, 12 of them asking for specific judgments about the child's actions and four asking for overall ratings in general areas of behavior. The child is rated on a nine point bipolar scale on each of the sixteen characteristics. The teacher is asked to spend time observing the child for the purpose of the rating, and to re-evaluate the ratings over several days.

The teacher is asked to corroborate the ratings by referring to examples of specific behaviors.

Procedure. The tasks were presented in the following fashion. With the instances task, for example, E began by saying, "In this game I am going to tell you something, and you tell me all the things you can think of that are like what I have said. I might say name all the things that hurt." E then let the child respond, praised his suggestions, and added some others to them. When the child understood the task, the other stimuli were presented. During the presentation of the stimuli that followed, the same procedure was used. The S's responses were recorded as given and counted, omitting repetitions.

Administration of each task was similar. Each task was completed for the entire group before E proceeded to the next task. Those tasks which generated the most game-like atmosphere were presented first, as follows: instances, alternate uses, pattern meanings, line meanings, block meanings, Goodenough-Harris Draw-A-Man Test.

The teacher rated the children on the Comtois scale. In order to preserve the independence of the measurement procedure, there was no discussion between the teacher and E concerning their respective tasks, or characteristics of the children.

Es were a white female and a black male. The procedures were randomly counterbalanced to control this experimenter variable. Therefore, both Es spent an equal amount of time with each S.

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Results and Discussion

The Kendall Tau or rank correlation coefficient, a non-parametric procedure (Kendall, 1962) was used to compare the F and I.Q. dimensions. These correlations were presented in Table 1. (The 5% and 1% critical values are +.275 and +.389 respectively.) The only F measures showing significant correlations with I.Q. were the lines measures. This task which requires the child to engage in active abstract representation for each response may rank the children on some developmental continuum involving representation ability which is ralated to I.Q.

The highest intercorrelations among F scores presented in Table 1 are those showing the correlation between Uniqueness and Fluency scores derived from a single task. For separate tasks patterns and instances show high individual inter-correlations but low correlation with I.Q.. These, along with uses, would seem to be promising measures of F in this age group. The patterns task also shows a significant correlation with the lines task. It seems reasonable from inspection (See appendices A and B) that the lines and patterns correlation could be accounted for by the geometric nature of these two sets of stimuli. That patterns show a lower correlation with I.Q. could be accounted for by the more evocative nature of the particular patterns stimuli for this age group. That is, the subjects offered many more possible associates for the patterns stimuli than for the lines. The experimenter designed blocks task is remarkable for its low relationship to every other measure.

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Insert Table 1 about here

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To summarize the correlation presented in Table 1, average correlations among F measures, and between F and I.Q. were computed. These average correlations are shown in Table 2. Kendall's Tau gives evidence that those tasks labeled creativity instruments by Wallach and Kogan generally show higher correlations among themselves than with I.Q., at least for this sample of Black kindergarten children.

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Insert Table 2 about here

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With several sets of scores available, it seemed relevant to employ multivariate techniques for investigating the interrelationships among the various kinds of data. The emphasis in this undertaking was less a matter of obtaining firm information from the data, and more a matter of demonstrating how these techniques might be employed to handle this kind of information. Considering the small sample size, the results, although interesting, should be considered tentative at best.

Hotelling's principal components technique was used to determine which tasks contributed most heavily to the overall F score. The lines task was omitted because of its low correlation with the other measures. This technique is a multi-variate procedure which investigates dependency structures within a set of data. (Morrison, 1967). Estimates of the coefficients of the variables are found accounting for the variability of the data (eigenvectors). Anderson (1958) states that principal components analysis is used to find the linear combination with large variance. The first principal component is the normalized linear combination with maximum variance. When only measures of Fluency (number of responses) were

analyzed, the first component indicated that the instances and patterns tests were the heaviest contributors to the overall score (see Table 3).

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Insert Table 3 about here.

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When uniqueness and fluency scores were both included in the analysis, the coefficients of the first component were less variable, but instances and patterns remained dominant (see Table 4).

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Insert Table 4 about here.

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The high weightings given to patterns and instances in principal components analysis indicates the importance of these tasks in measuring the F dimension. This taken together with the high inter-correlations of these tasks and their low correlation with I.Q., suggests that these tasks are most appropriate for measuring F as separate from I.Q.. The weighting in Table 3 indicate that little would be lost if only these tasks were used to assess F. (Since all of these tasks are individually administered, time saved is also a consideration.) The first principal component was subsequently used to determine an overall F score for each S.

Discriminant analysis can be considered as similar to the principal components procedure in that it determines independent linear combinations of variables. In this case, the criterion for choice is to maximize the Euclidian distance between given group means. Discriminant analysis was also done between high and low I.Q. groups, male and female, using the F measures as discriminants.

If I.Q. and F measures are tapping intellectual functions which are independent (as the correlation pattern would indicate) one would not expect a linear combination of F measures to discriminate between the high and low I.Q. groups of each sex. Rather, one would expect the plotted points representing members of these groups to be dispersed on the page without systematic separation among the groups. Fig. 1 gives a plot of this

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Insert Figure 1 about here

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discriminant analysis. The female Ss show the expected mixed scatter pattern. The male Ss, however, are discriminated into high and low I.Q. groups. Several conditions contribute to this finding. Looking at the order in which variables were entered and the weightings of the first two discriminants, it becomes apparent that the first discriminant (dominated by the patterns measure) partially separates the sexes. The second discriminant (dominated by lines) discriminates between high and low I.Q. male groups. Lines, in this study was not found to correlate highly with the other F measures, but rather to correlate with the Goodenough-Harris I.Q. estimate. In light of the hypothesis of greater I.Q. variance in males, it is interesting that it is male Ss that were discriminated into high and low I.Q. groups.

Wallach and Kogan had used clinical techniques to find personality characteristics associated with I.Q. and creativity status of their subjects. The informal Comtois Early Childhood Rating Scales were used, in an exploratory way, to similar ends. Table 5 shows the weighting resulting from principal components analysis of these scales.

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Insert Table 5 about here

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The potential for this kind of technique in relating to school kinds of tasks is indicated by the possibility of interpreting the first four components in relation to behavior which would predict school success. As shown in Table 5, the first principal component of the Comtois Scale rated the following behaviors; speaking frequently, verbally expressing complex and well-formed ideas, responding well to adults, confidence, general competence and overall level with regard to age expectation. The second component emphasized short attention to assigned activities, responsiveness to children, and high activity level. The third component included intelligibility of speech, learning and development rate, and development of social skills in peer relationships. The fourth component combined time spent on activities of creative self-expression with slow learning rate. These four components accounted for 83% of the total variance.

It is interesting to note that each of the first three components showed generally compatible characteristics in its weightings. The first component showed a pattern of behaviors which seem requisite to school success. The second component seemed to emphasize behaviors that interfere with school success. The third included elements which could be supplementary to component one. The fourth component might indicate that creative expression (time spent on such activities) and a slow learning rate are evaluated together. Perhaps the child who chooses to spend his time in creative behavior may need more time to learn school subjects. These findings suggest that the Comtois Scale may be assessing certain underlying

factors of behavior which are related to academic activities.

To compare the behavior ratings of the Comtois Scales with the other measures employed, the Ss were divided into four groups by division at the median of the F and I.Q. rankings. These were High F-Low I.Q., High F-High I.Q., Low F-High I.Q. Low F-Low I.Q., Eight groups could be similarly formed by a further division with sex as a variable.

Discriminant analysis of the four groups was achieved using the first two discriminants. These accounted for .90 of the total variance. The first discriminant most heavily emphasized "attention" in the positive direction. "Understanding relational concepts" was negatively loaded. Amount of time spent in activities of creative expression was a strong positive contributor to this component. Fig. 2 shows that the first

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Insert Figure 2 about here

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discriminant was responsible for separating the high and low I.Q. subjects. The second discriminant was much less variable in its weightings. This separates the groups who were either high or low on both dimensions from those who were high on one, low on the other. An interaction seems indicated but was not readily interpretable.

The eight groups, with sex as the third variable, require the first three discriminants for an adequate separation. The first three discriminants account for .99 of the variance in these data. See Table 6.

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Insert Table 6 about here

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The ability of the Comtois ratings to make these discriminations suggests that there are differences in the classroom behaviors of these groups of children which a molecular analysis of this kind reveals. Without over-emphasizing the importance of these results, they indicate that further work should be done with this informal technique. Clinical procedures, always more expensive and more reliable than such informal techniques have begun to come under fire as inappropriate for subcultural children. A scale such as this rates the child in relation to his peers, and is intended by its designer to yield prescriptive teaching. If new techniques will be needed, this one deserves exploration.

It would seem that evidence of separate cognitive modes, F and I.Q. are discernible in kindergarten children. Consideration of the child's level of understanding of the concepts involved in F stimuli appears to be a major consideration in selecting the tasks to be employed. Figural stimuli seem to require careful choice so that the children can relate to them.

Assuming for the moment that the F tasks are related to creativity as their designers intend, some discussion of these results in the framework of the literature concerning creativity and I.Q. is called for. This study contributes evidence for the orthogonality of these dimensions. The Goodenough-Harris I.Q. of the sample ranges from low normal through high designations. For this sample I.Q. and creativity appear separate even at the lower I.Q. levels. If then, there are children who are low in I.Q. and high in creative potential, educational planning should take cognizance of this. Low I.Q. predicts poor success in school and may lead to placement of the child in low ability groups. Rather, if the creative mode can find

application in the learning environment, recognition in planning should be given to the potentially creative child, regardless of I.Q.

Summary

This study employs the techniques developed by Wallach and Kogan as creativity instruments in conjunction with the Harris-Goodenough Draw-A-Man test as an I.Q. estimate and the Comtois Early Childhood Rating Scales as an indicator of classroom behavioral characteristics. The sample is a group of 19 black kindergarten children. The interrelationships of these measures were investigated using Kendall's Tau and multivariate techniques.

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Table 1

F Intercorrelations and Correlations with I.Q.

Measure	LF	UF	PF	IF	BF	LU	UU	PU	IU	BU	RIQ	SIQ
Lines Fl.												
Uses Fl.	.16											
Patt. Fl.	.38*	.36*										
Inst.Fl.	.17	.19	.52+									
Block Fl.	.16	.07	.16	.25								
Lines Un.	.91+	.25	.51+	.23	.13							
Uses Un.	.21	.81+	.40+	.35*	.27	.27						
Patt. Un.	.43+	.30*	.85+	.46+	.20	.51+	.37*					
Inst. Un.	.20	.19	.44+	.80+	.22	.24	.39+	.43+				
Block Un.	.18	-.02	.16	.24	.80+	.15	.14	.16	.18			
Raw I.Q.	.50+	.12	.17	-.05	.03	.46+	.12	.20	.02	-.01		
Stan.I.Q.	.43+	.08	.27	-.01	-.10	.43+	.06	.21	.02	-.12	.81+	

* $p < .05$

\+ $p < .01$

Table 2

F Average Intercorrelations and Correlations with I.Q.

Correlation Measure	Among Fluency Scores	Among Uniqueness Scores
Kendall Tau	.24	.29

	Fluency-I.Q.	Uniqueness-I.Q.
Kendall Tau	.12	.14
(Lines Omitted)	.05	.07

Table 3

Principal Components of Fluency F Measures

Task	Eigen Vectors 1	2	3	4
Uses	-0.2789	-0.8373	-0.3002	-0.3618
Patterns	-0.5945	-0.2154	0.2850	0.7204
Instances	-0.5701	0.2642	0.5054	-0.5914
Blocks	-0.4938	0.4274	-0.7571	0.0198

Table 4

Principal Components of F Measures

	Eigen Vectors 1	2	3	4	5	6	7	8
Fluency								
Uses	-0.2103	-0.5933	0.1813	0.2492	0.0325	0.2530	0.2535	0.6159
Patterns	-0.4140	-0.1523	-0.2650	-0.4989	-0.5266	-0.3523	0.2878	0.0458
Instances	-0.4051	0.2094	-0.3328	0.4121	-0.2286	0.5484	0.2400	-0.3175
Blocks	-0.3603	0.2904	0.5032	-0.1121	-0.3699	0.2157	-0.5419	0.2080
Uniqueness								
Uses	-0.2566	-0.5182	0.2969	0.3087	-0.0483	-0.3096	-0.2094	-0.5832
Patterns	-0.4152	-0.1997	-0.2537	-0.4536	0.5852	0.2755	-0.2996	-0.0965
Instances	-0.3831	0.2744	-0.3102	0.4420	0.2251	-0.5264	-0.2113	0.3375
Blocks	-0.3247	0.3360	0.5331	-0.1004	0.3703	-0.1250	0.5686	-0.1058
Eigenvalues	3.84	2.08	1.19	.77	.04	.04	.03	.02

Table 5

Component Analysis of the Comtois Scales

	Eigen Vectors			
	1	2	3	4
Amount of speech	0.3161	0.1949	-0.0962	0.1274
Intelligibility of words	0.1001	0.2981	0.5376	0.2960
Verbal expression (ideas)	0.3321	-0.0161	0.0632	-0.1404
Responsiveness to adults	0.3095	0.2126	0.0364	-0.2661
Responsiveness to other children	0.2593	0.3875	-0.1712	0.1394
Self-assertive with adults	0.2684	0.2641	0.1641	-0.0659
Activity	0.2005	0.3938	-0.3271	-0.0005
Confidence	0.3004	-0.2284	0.0456	0.2796
Attention	0.2084	-0.4820	0.0488	-0.1043
Amount creative expression	0.1903	-0.2212	-0.1004	0.5208
Social skills with peers	0.1010	-0.1122	-0.6254	0.2821
General competence	0.3208	-0.1507	0.0564	-0.0150
Relational concepts	0.2979	-0.1930	0.1724	-0.1509
Learning rate	0.2131	-0.0624	-0.2714	-0.5648
Overall	0.2956	-0.2068	0.1450	0.0059

Table 6

Discriminant Analysis of Eight Groups
Using the Comtois Scales

COEFFICIENTS FOR CANONICAL VARIABLE

ORIGINAL VARIABLE			
Amount of Speech			
Distinguishability of words	7.75084	-6.15367	0.52818
Verbal expression (ideas)	5.08914	-4.87612	-0.15636
Responsiveness to adults	-3.32839	6.62156	-1.12157
Responsiveness to other children	3.49050	3.96966	0.66013
Self-assertive with adults	--	--	--
Activity	-1.49938	-8.68584	0.93725
Confidence	-4.38418	0.67255	-0.62470
Attention	0.35840	-7.74170	2.78514
Amount creative expression	0.0	0.0	0.0
Social Skills with peers	3.85790	2.95076	-1.15310
General competence	-1.40287	-0.16201	0.73399
Relational Concepts			
Learning rate	4.43579	-3.88390	0.34762
Overall level	-2.72960	7.21134	-2.10432

Fig. 1. Discriminant Analysis of I.Q. Groups using F measures

H = High I.Q. Male
L = Low I.Q. Male
B = High I.Q. Female
S = Low I.Q. Female
* = Group Mean

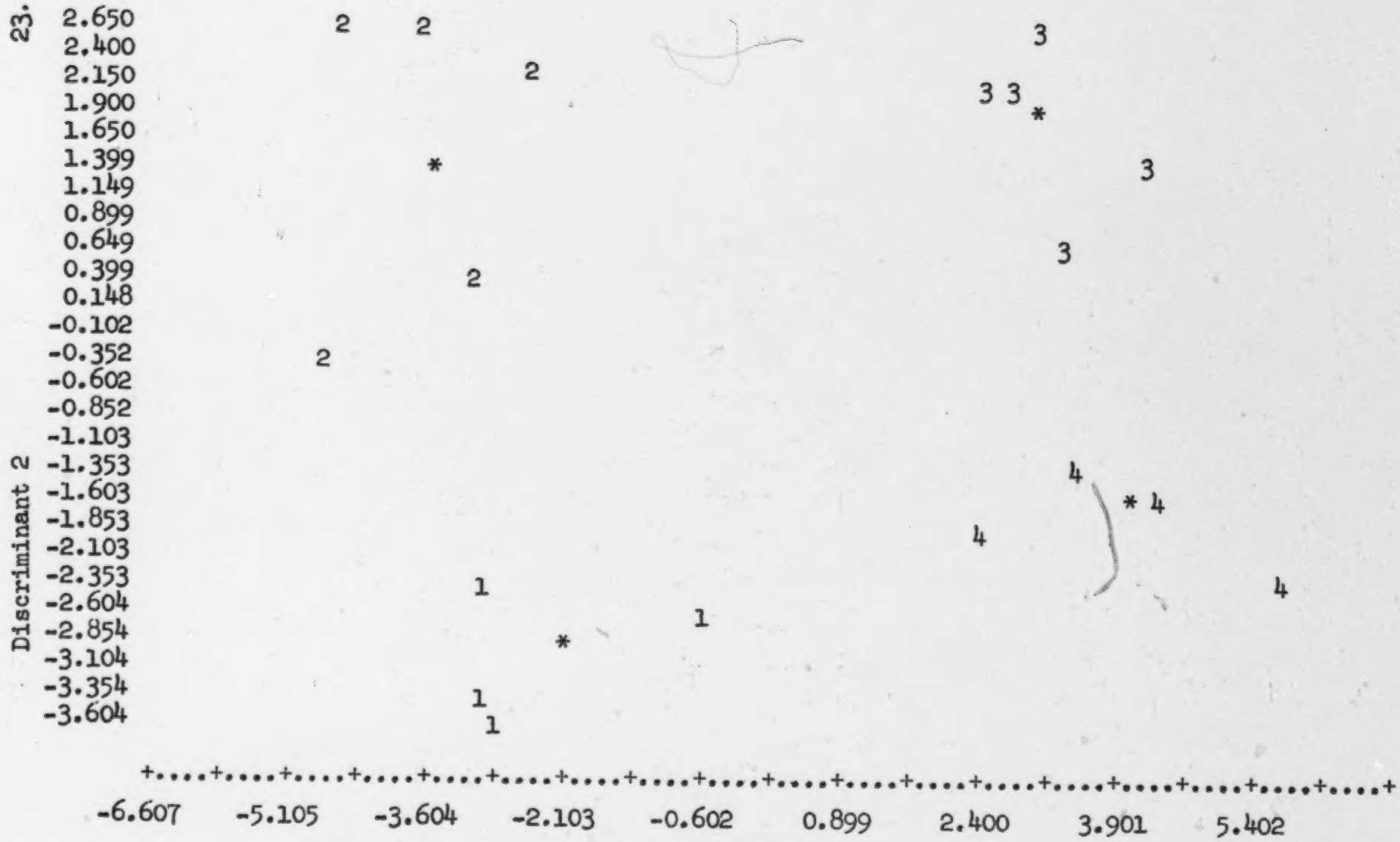
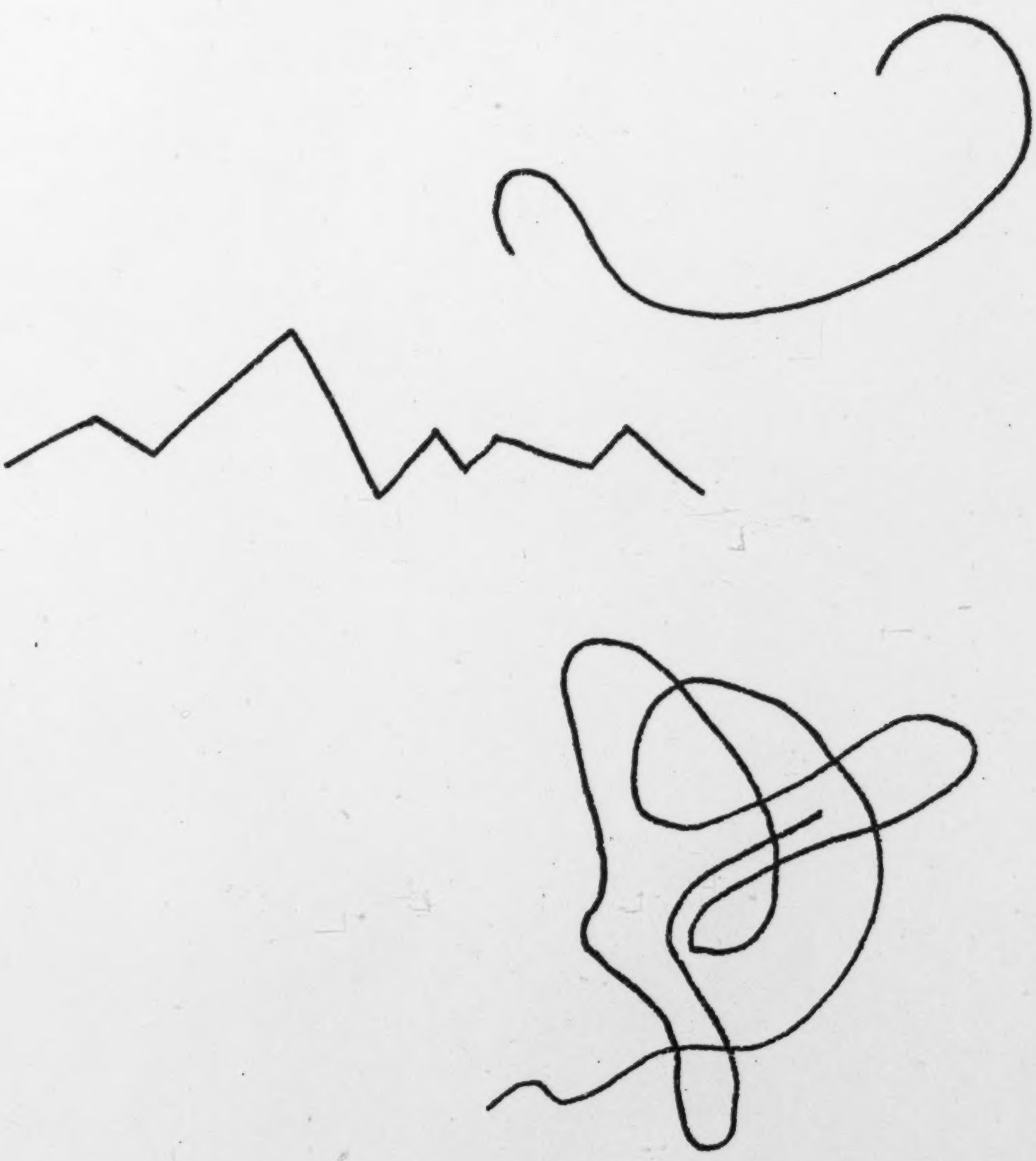


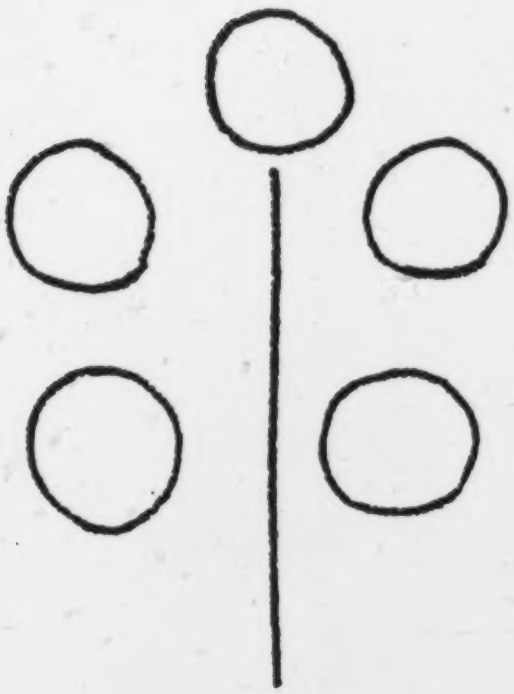
Fig. 2. Discriminant Analysis of 4 Groups using the Comtois Scales

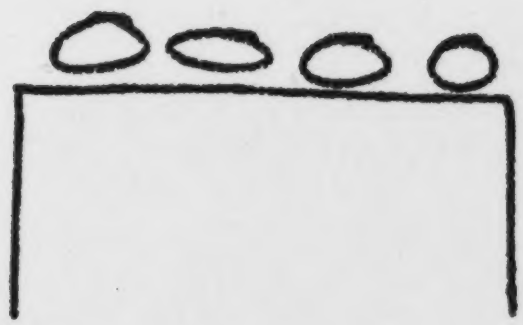
1 = Low I.Q. Low F
2 = Low I.Q. High F
3 = High I.Q. Low F
4 = High I.Q. High F
* = Group Mean

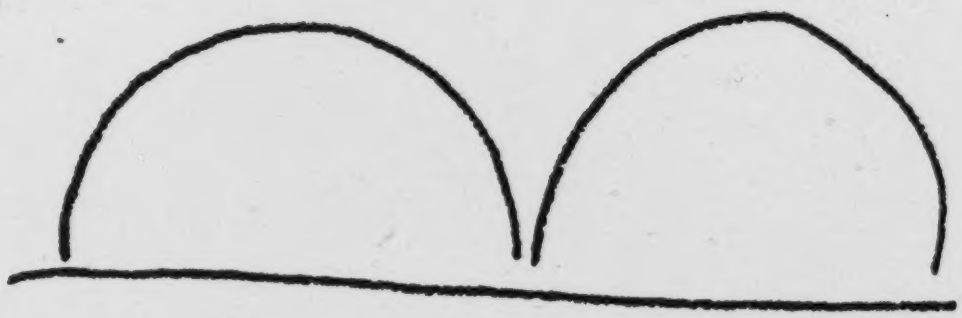
Appendix A Lines Stimuli



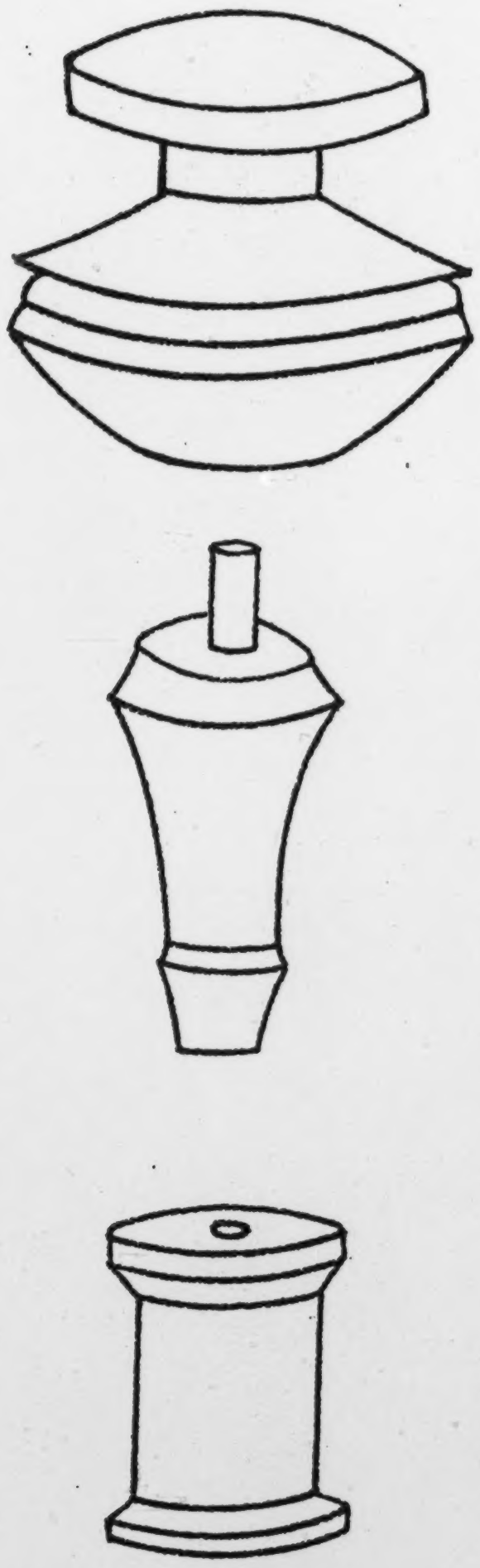
Appendix B Patterns Stimuli







Appendix C Blocks Stimuli



Appendix D Uses Stimuli

Shoe

Knife

Newspaper

Chair

Appendix E Instances Stimuli

Circle

Square

Things that make noise

Things that have wheels

Appendix F

Early Childhood Rating Sclaes

How much does he speak at school?

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*How much does he speak at home?

How hard is it to recognize (understand; distinguish the words he is using when he speaks)?

How complex and well formed are the ideas and other information which he expresses verbally?

How much responsiveness does he show to the adults in the school? (Non-verbal or verbal.)

How much responsiveness does he show to the other children in the school? (Verbal or non-verbal.)

How self-assertive is he in dealing with adults?

How active is he?

How confident is he about being able to master new materials, activities and situations as he encounters them in school?

For how long a time does he pay chose attention to things which are demanding of him?

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*Not included in this study.

How much is he involved in creative self-expression?

How well developed are his social skills for dealing with his peers?

How competent is he in general, relative to what you expect from a child his age who is progressing adequately?

Overall, to what degree does he understand relational concepts?

On an overall basis, at what rate is he learning (improving, developing) relative to what you would expect from a child his age?

Overall, at what level do you place him relative to what you would expect from a child his age who was developing adequately?

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*In which areas of development or accomplishment does he need special help? List these areas briefly.

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*Not included in this study.